5.2/12) $f(x) = x^{4/3} - 6x^{1/3}$

$$f'(x) = \frac{4}{3}x^{1/3} - 2x^{-\frac{2}{3}}$$

$$= 2x^{1/3}\left[\frac{2}{3} - x^{-1}\right]$$

$x = 0$

$$\frac{2}{3} - \frac{1}{x} = 0$$

$\frac{4}{3}x^{\frac{1}{3}} - 2x^{-\frac{2}{3}}$

$2x^{-\frac{2}{3}}\left[\frac{2}{3}x - 1\right]$

$$\frac{2x-3}{3x} = 0$$

$2x = 3 \quad x = \frac{3}{2}$

calc

- - - | - - - | + + + + +

$-11 \quad 0 \quad 1 \quad \frac{3}{2} \quad 1002$

$f' \nexists$ (under 0) $f' = 0$ (under $\frac{3}{2}$)

inc: $\left[\frac{3}{2}, \infty\right)$

dec: $(-\infty, 0) \cup \left(0, \frac{3}{2}\right]$

@ $x = \frac{3}{2}$

rel MIN

$$f'(x) = \frac{4}{3}x^{1/3} - 2x^{-\frac{2}{3}}$$

$$f''(x) = \frac{4}{9}x^{-\frac{2}{3}} + \frac{4}{3}x^{-5/3}$$

$$= \frac{4}{9}x^{-\frac{5}{3}}\left[x + 3\right] = 0$$

f'' und

$f'' = 0$ at $x = -3$

$f''\left(\frac{3}{2}\right) =$

$\frac{4}{9}\left(\frac{3}{2}\right)^{-5/3}\left[\frac{3}{2} + 3\right]$

> 0

$\therefore$ rel MIN

+ + + | - - - | + + +

$-10 \quad -3 \quad -1 \quad 0 \quad +1$

c-up: $(-\infty, -3) \cup (0, \infty)$

c-dn: $(-3, 0)$

17 a)

$x=0$ $\qquad (x-\sqrt{5})(x+\sqrt{5}) \qquad x^2=5$

$$f'(x) = x^3(x^2-5) = 0$$

Solve for 0 / und

f' ALWAYS def $\qquad f'=0 \Rightarrow$

$x = 0, +\sqrt{5}, -\sqrt{5}$

sign chart of

f' $\quad$ -- - | ++ + | - -- | + +++

$-10 \quad -\sqrt{5} \quad -1 \quad 0 \quad +1 \quad \sqrt{5} \quad +10$

inc: $[-\sqrt{5},0] \cup [\sqrt{5},\infty)$

dec: $(-\infty,-\sqrt{5}] \cup [0,\sqrt{5}]$

min: $x=-\sqrt{5}, +\sqrt{5}$

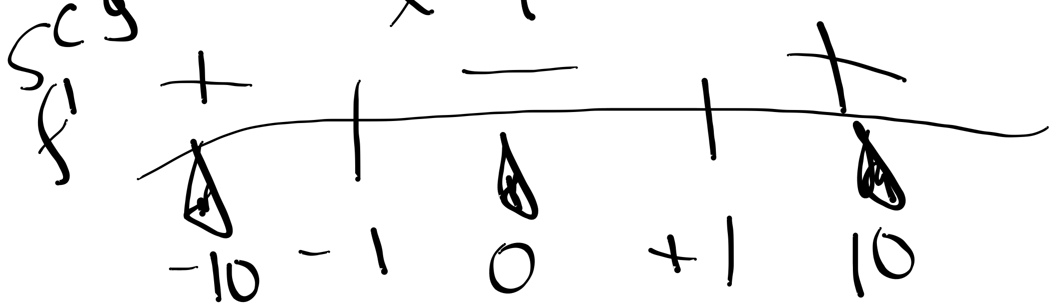
max: $x=0$

17b) $f'(x) = \dfrac{x^2-1}{x^2+1} = 1 - \dfrac{2}{x^2+1}$

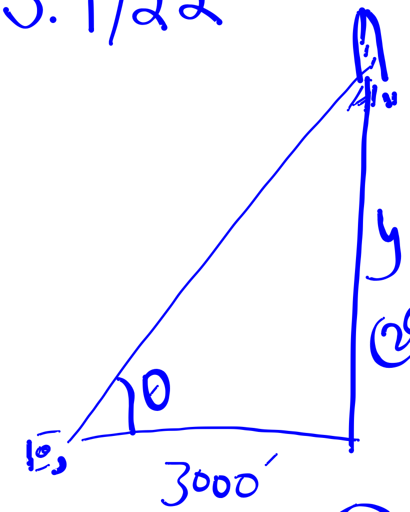
$\dfrac{(x^2+1)-2}{x^2+1}$

$f'(x) = 0$ when

$x^2 - 1 = 0 \quad \therefore \quad x = -1, +1$



3.7/22



$\frac{d\theta}{dt} = 0.2 \frac{\text{radians}}{\text{sec}}$ | interest: $\theta = \frac{\pi}{4}$

(2) $\tan\theta = \frac{y}{3000}$

(3) $\sec^2\theta \cdot \frac{d\theta}{dt} = \frac{1}{3000} \frac{dy}{dt}$

$\sec\left(\frac{\pi}{4}\right) = \frac{1}{\cos\left(\frac{\pi}{4}\right)} = \frac{1}{\frac{\sqrt{2}}{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$

(4) $\sec^2\left(\frac{\pi}{4}\right)(0.2 \text{ rad/sec}) = \frac{1}{3000'} \frac{dy}{dt}$

$(\sqrt{2})^2(0.2)(3000) = \frac{dy}{dt}$

$1200 = \frac{dy}{dt}$ [ft/sec]